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Information Bulletin

Grade 6 Science

**1993-94
School Year**

This document was written primarily for:

Students	✓
Teachers	✓
Administrators	✓
Parents	
General Audience	
Others (Specify)	✓ Superintendents

This bulletin contains general information about the 1994 Achievement Testing Program and information specific to Grade 6 Science Assessment. Additional copies of the bulletin may be obtained by telephoning Alberta Education at 427-0010.

DISTRIBUTION: Superintendents of Schools • School Principals and Teachers • The Alberta Teachers' Association • Alberta School Boards Association • Officials of Alberta Education • General Public upon Request

October 1993

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General Information

The Achievement Testing Program provides Alberta Education, school jurisdictions, schools, and the public with information significant at the provincial and local levels about what students know and can do in relation to provincial standards. It does not provide information to be used for student placement or promotion.

The assessments are administered on a four-year cycle in four subject areas—language arts, social studies, mathematics, and science—and at three grade levels—3, 6, and 9.

The assessments are based on provincial standards as reflected in the *Program of Studies* prescribed by the Minister of Education. Classroom teachers from across the province participate in developing and field testing the assessment instruments.

Administering the Assessment

Information about the nature and administration of the provincial assessments, about exemptions and special provisions, and about students receiving instruction in French can be found in the *Achievement Testing Program General Information Bulletin, 1993–94 School Year*, which has been mailed to all superintendents and principals.

Schedule

The achievement tests must be administered during the week of June 6 to June 10, 1994. The tests can be scheduled at any time during that week, as approved by the superintendent. We recommend, however, that schools organize their calendars so that the tests are completed on Tuesday, June 7.

Students who are absent when the tests are administered and who return to school by June 10 must write the tests upon their

return. By scheduling the tests early in the week, schools can ensure that most, if not all, absentees are tested. The tests from a school must be returned to Alberta Education as soon as possible after completion, but no later than June 13, 1994.

The tests that will be administered in 1994 are:

Grade 3 Mathematics (English and French translation)

Grade 6 Science (English and French translation)

Grade 9 English Language Arts
(*Part A: Writing and Part B: Reading*)

Français 9^e Année (*Partie A: Production écrite and Partie B: Lecture*)

Grade 6 French Immersion and Francophone students taking science in French are expected to write the French translation of the Grade 6 Science Achievement Test. A provincial sample of students in French language programs will write the English version of this test. This will provide us with useful information and help us in reporting results. This approach was recommended based on the findings of the *Language of Testing Study* conducted in 1989, 1990, and 1991, and on discussion with stakeholder groups which followed in 1990, 1991, and 1992.

Alberta Education will send enrolment forms to schools by February 1994 requesting an indication of how many English and French tests are required. These forms must be returned through jurisdiction offices by March 5, 1994.

The principal is responsible for ensuring the security of the tests from the time they are received until they are returned to Alberta Education. To minimize any risks to security, we recommend that all students in the school complete the test on the same day.

Reporting the Results

In mid-October 1994, each school jurisdiction will receive a district profile and school reports for their students' achievement, as well as guidelines for interpreting these results in relation to provincial standards.

To facilitate reflection on school programs, we expect that results will be shared with school staff (not just teachers of grades 3, 6, and 9), as well as with parents and the community.

We also expect that Individual Student Profiles will be shared with parents upon request.

In December 1994, provincial results will be made public through the annual *Achievement Testing Program Provincial Report*.

Broadened Assessment Initiatives

The Student Evaluation Branch has developed instruments to collect a broader base of information to help provide a more complete picture of what students know and can do. These instruments will be administered to a provincial sample of students in the spring of 1994 as follows:

Grade 3

- open-ended problem-solving activities in mathematics

Grade 6

- performance tasks in science

Grade 9

- listening and viewing skills activities in English Language Arts

The information from these broadened assessments will complement that already provided by the provincial achievement tests.

Description of Science Assessment Standards

Introduction

The provincial standards below are used to assess how well students have learned grade 6 Science. While these standards primarily reflect the general learner expectations of the Alberta course of studies, they describe essential learnings that all Alberta students are expected to achieve. Provincial standards are useful therefore, for assessing grade 6 students in all types of school programs—public, private, and home education.

Acceptable Standard

Students who meet the acceptable standard are expected to perform routine cognitive and psychomotor tasks, and procedures that are fundamental to the program. Also, they should be able to solve routine problems and apply skills in novel contexts or situations. For example, they are expected to make observations of what happens to light as it is reflected or refracted and to predict the effects of mirrors and lenses in new applications. They should be able to follow directions to construct a device. Also, they should be able to construct devices that help to solve a problem. For example, they should be able to construct a circuit tester and use it to find the connections in a hidden circuit.

Students who meet the acceptable standard are expected to be skilled in the use of basic processes of science, and to apply more advanced skills in straightforward tasks. They are expected to know about the impact of science and technology on society and be able to view an issue from more than one perspective. They are expected to form judgments when they have sufficient information to make an informed decision. They are expected to make judgments about environmental problems and to support their views with relevant information.

Standard of Excellence

Students who meet the standard of excellence in Grade 6 Science are expected to have a superior understanding of the essential conceptual and procedural knowledge. For example, they are expected to know that energy exists in different forms and can be classified as renewable or nonrenewable and understand that the conservation of energy and the development of alternate energy sources are essential to our future well-being.

These students are expected to have a good understanding of concepts and skills. For example, they are expected to be knowledgeable about the local living things and the environments they live in and to make observations and inferences about living things in distant environments. Also, they should be able to interpret a diagram showing the effects of rain on the landforms in a mountain valley and then be able to predict the long term effects on water flow in the valley.

Students are expected to use their conceptual and procedural knowledge purposefully and confidently. They should be able to perform higher cognitive and psychomotor tasks and use these skills in new or novel situations. For example, they are expected to design and complete a controlled experiment to test the performance of a toy in varied conditions, collect a set of data, and make inferences about the performance of the toy in these conditions.

Students achieving the standard of excellence are expected to exhibit an awareness, appreciation, and interest in science as it relates to the environment, themselves, and society. They are expected to be open-minded, persistent problem-solvers and be able to look at a problem from a number of viewpoints. Another expectation is that they know how science and technology affects them personally and are able to examine its societal implications. Also, students should be able to investigate a

problem by gathering information from a number of sources—even when information is incomplete or has contradictions—and make summary or tentative conclusions.

Grade 6 Science Assessment

General Description

The Grade 6 Science Assessment is designed to collect information on the degree to which students are meeting provincial standards in science as reflected in the Alberta Science *Program of Studies*, 1991.

The achievement assessment instrument (machine scored) consists of 60 multiple-choice questions.

Students will record their answers on a separate answer sheet. They will have a maximum of one hour and thirty minutes to complete the questions. We suggest that those students who finish writing before one hour has elapsed remain at their desks to review their answers.

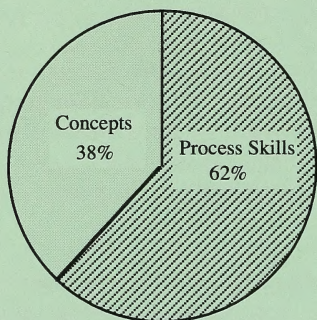
Students will need HB pencils, erasers, and scrap paper. Calculators are not required for successful completion of the assessment but are permitted.

Content

Four major components serve as a guideline for the development of the achievement assessment. These are:

Domain	Emphasis
Process Skills	50%
Psychomotor Skills	10%
Attitudes	10%
Concepts (Subject Matter)	30%

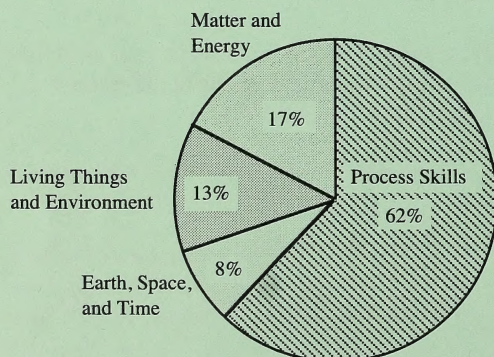
The machine-scored part of the assessment is limited to those areas of learning that may be efficiently assessed using paper and pencil. While some questions may reflect the psychomotor skills domain, basically it is the process skills domain and the concepts domain that are assessed. The circle graph below shows the assessment emphasis for concepts (subject matter) and process skills.



The concepts domain is divided into three topics to reflect the Grade 6 Science core. These topics are

1. Matter and Energy
2. Living Things and Environment
3. Earth, Space, and Time

It should be noted that within the process skills domain all process skills will be represented, however, emphasis will be placed on inferring, predicting, controlling variables, and interpreting data. The emphasis given to each topic and to process skills is shown in the circle graph below.



Performance-Based Assessment

Performance-based assessment provides real-life problem-solving activities. This assessment addresses areas of learning that cannot be assessed by means of machine-scorable instruments. It provides a broader picture of what students know and can do. In 1994, a provincial sample of Grade 6 students will participate in this assessment. Six to eight hands-on assessment activities will be used; after completing an activity, students move on to a different activity. Although there is no time limit, students are encouraged to complete each activity within 10 to 15 minutes. Schools selected to participate in this assessment will be notified in April 1994.

Confirming Standards

Confirming standards is a process whereby judgments about students' performance on the assessment are made in relation to provincial standards. For more information on confirming standards procedures, refer to Appendix A of the *Achievement Testing Program Provincial Report, June 1993 Administration*. For information on the selection of teachers for participation in the confirming standards process, refer to the *Achievement Testing Program General Information Bulletin, 1993-94 School Year*.

Learning Contexts Survey

In 1994, learning context survey questionnaires will be completed by a provincial sample of Grade 6 teachers and students.

The purpose of the student questionnaire is to examine the extent to which science attitudes are evident, to look at student attitudes toward science, and to correlate these attitudes with achievement.

The purpose of the teacher questionnaire is to collect information on the effect on student achievement of the classroom environment, the variety of instructional strategies used, and the use of different approaches to scientific investigations and problem solving.

Preparing Students for the Assessment

I strongly advocate preparing children to understand tests and testing through extensive class discussion about the makeup of the test and how to take it, and then adequate practice to find out their own particular weaknesses in approaching tests.

—Graves, p. 183

- Talk with your students about some of the positive and negative aspects of taking tests. Share some of your own experiences and have your students share theirs.
- Familiarize your students with the format of the Achievement Assessment and the kinds of questions that will appear on it by having them work through the sample questions.

Suggestions for Answering Machine-Scorable Questions

Share the following information when preparing students for writing the Grade 6 Science Achievement Assessment.

- The questions in the Achievement Assessment are integrated in narrative themes.
- A theme page has a picture and a short description of what the questions that follow will be about. Study the theme page carefully—there may be information that can be used to answer the questions.
- Use other information given for answering questions
 - a. by reading the information and thinking carefully about it before you try to answer any of the questions that need the information; or
 - b. by reading the questions first and then reading the information, keeping in mind the questions you need to answer.
- When information is given for more than one question, remember to go back to the information before answering each question.
- Make sure you look at all forms of information given. Information may be given in words, charts, pictures, graphs, and maps.
- When answering questions, choose the answer you think is best. If you don't see a correct or best answer right away, try to find the two choices that seem closest to the correct answer and pick one of them for the answer.

Blueprint

The emphasis for each assessment component and learning domain are presented in the blueprint.

1994 Grade 6 Science Assessment Blueprint

Topic	Per Cent of Course	Per Cent Emphasis*	
		Learning Domain	
		Concepts	Skills
1. Matter and Energy	45	17	28
2. Living Things and Environment	34	13	21
3. Earth, Space, and Time	21	8	13
Total	100	38	62

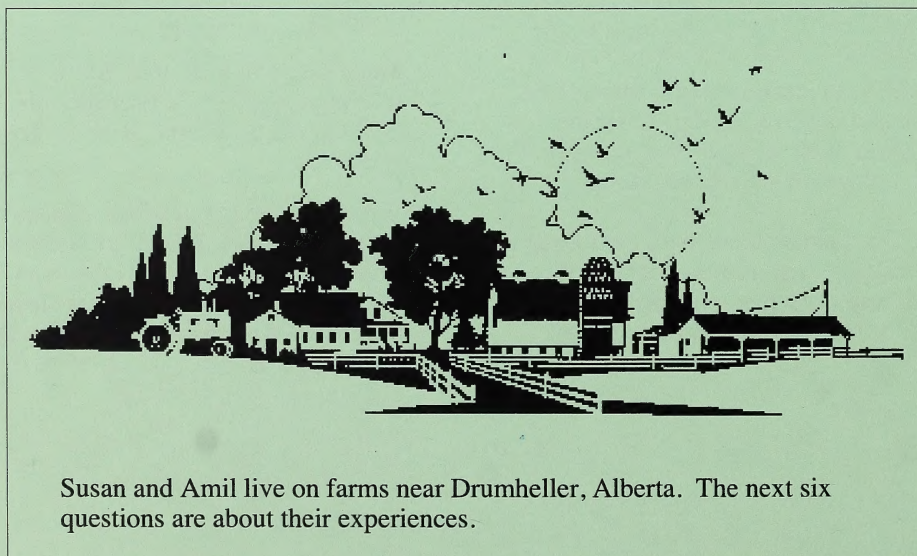
¹The proportion of questions on the test may vary slightly from those indicated in the learning domain.

Sample Questions

Presented on the following pages are sample questions reflecting the nature and complexity of the questions that will appear on the 1994 Science Assessment.

We encourage teachers to familiarize students with the assessment by having them work through these sample questions.

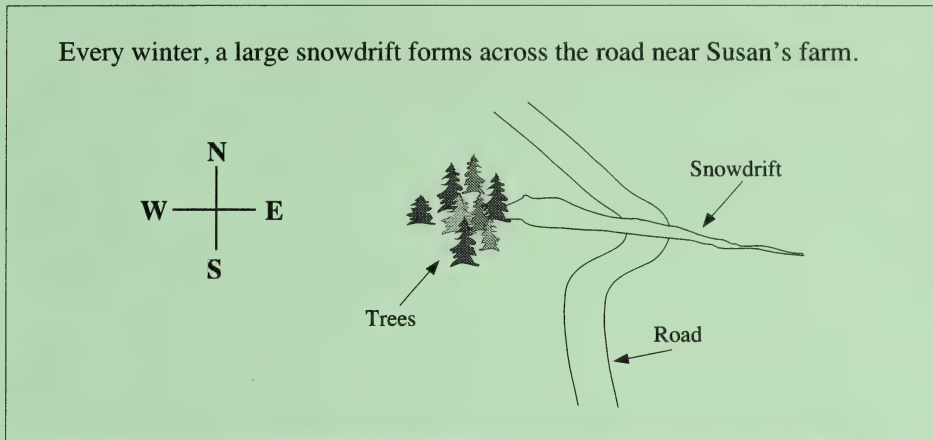
FARM



Susan and Amil live on farms near Drumheller, Alberta. The next six questions are about their experiences.

Question 1

Use the following information to answer question 1.



1. The wind will blow **mainly** from which direction?

- A. South
- B. East
- C. North
- *D. West

Curriculum Standard: The student is able to predict the wind direction from the location of a snowdrift.

Topic: Earth, Space, and Time (Weather)

Domain: Skills

*The asterisk indicates the correct response.

Question 2

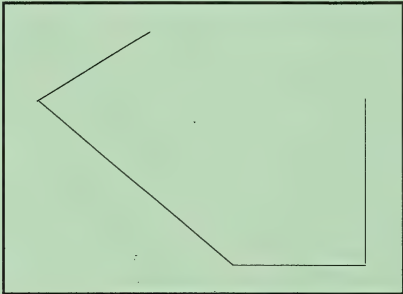
Use the following information to answer questions 2 and 3.

Amil wanted to know where field mice live under the snow. He measured the temperature of the ground surface in different locations in a field. Each location was covered by different depths and types of snow. He recorded his results on a map.

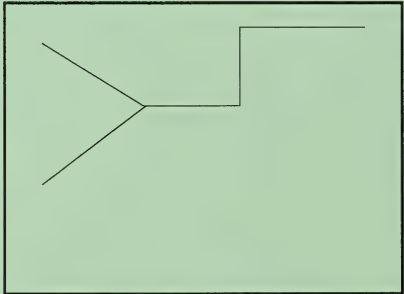
+1°C	-2°C	+2°C	+1°C
-4°C	+3°C	+3°C	-3°C
+2°C	-2°C	-1°C	-2°C
+1°C	0°C	-1°C	-3°C

2. Field mice make paths under the snow where the temperatures are **above** 0°C. Which map shows the **most likely** path locations?

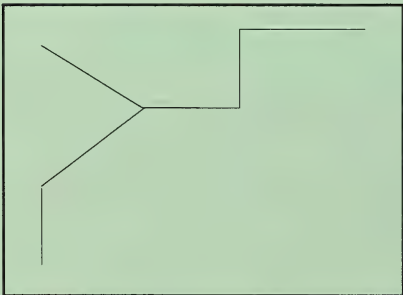
A.



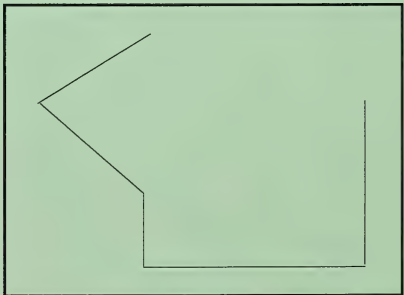
B.



*C.



D.



Curriculum Standard: The student is able to infer where a field mouse lives from a map showing temperatures under the snow.

Topic: Living Things and Environment (Environment and Ecosystems)

Domain: Skills

Question 3

3. If the temperatures **decreased** by 1°C , there would be
- A. an increase in the number of paths
 - B. an increase in the distance of the paths
 - *C. field mice moving in a smaller area
 - D. field mice moving in a larger area

Curriculum Standard: The student is able to predict the effects of decreased temperature on the living space of field mice.

Topic: Living Things and Environment (Environmental Factors)

Domain: Skills

Question 4

Use the following information to answer question 4.

Susan is experimenting to find the fastest ski for a ski race. She wants to know if long skis slide faster than short ones. She identified these variables:

1. speed of the skier
2. mass of the skier
3. length of the skis
4. steepness of the hill

4. Which variables should she keep the same?
- A. 1 and 2
 - B. 1 and 4
 - C. 2 and 3
 - *D. 2 and 4

Curriculum Standard: The student is able to identify which variables should be kept the same in an experiment to test sliding speeds of different lengths of skis.

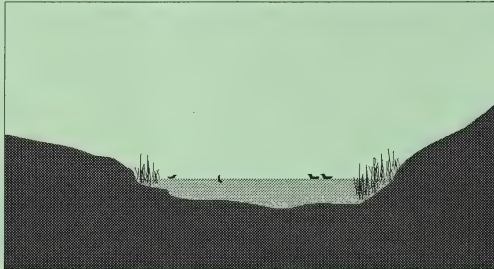
Topic: Earth, Space, and Time

Domain: Skills

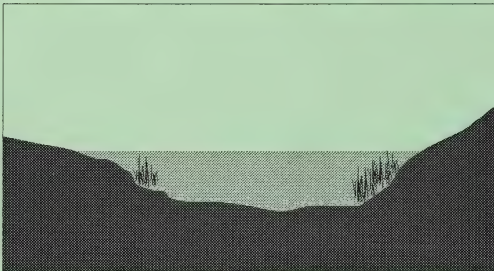
Question 5

Use the following information to answer question 5.

In the spring, there were many ducks that nested and fed among the reeds near the edge of a lake close to the farms. In the summer, however, there were fewer ducks because rain caused the lake's water level to rise.



spring



summer

5. The duck population **likely** decreased because the

- *A. number of nesting areas decreased
- B. predator population increased
- C. amount of recreation on the lake increased
- D. area of shallow water increased

Curriculum Standard: The student is able to identify the cause of a change in a duck population.

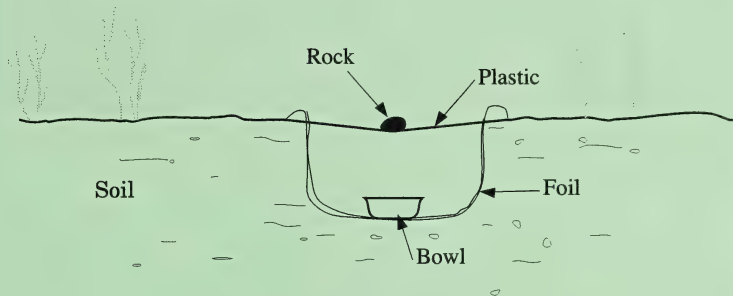
Topic: Living Things and Environment (Environment and Ecosystems)

Domain: Concepts

Question 6

Use the following information to answer question 6.

In order to practice desert survival skills, Amil made a solar water still. He dug a small hole in the ground and lined it with foil, placed a bowl in the bottom of the hole, covered the hole with plastic and placed a rock on top of the plastic. The following day, he found water in the bowl.



6. Where did the water droplets **likely** form?

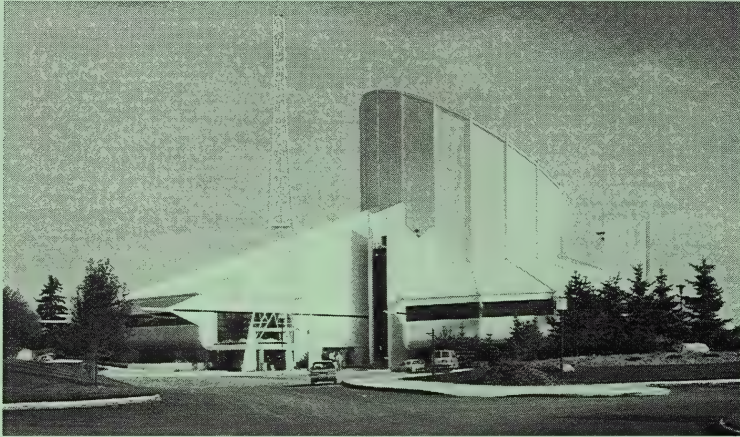
- A. In the bowl
- B. In the soil
- C. On top of the foil
- *D. On the underside of the plastic

Curriculum Standard: The student knows the effects of solar energy on water in a solar water still.

Topic: Matter and Energy (Energy Resources and Conservation)

Domain: Concepts

SCIENCE CENTRE

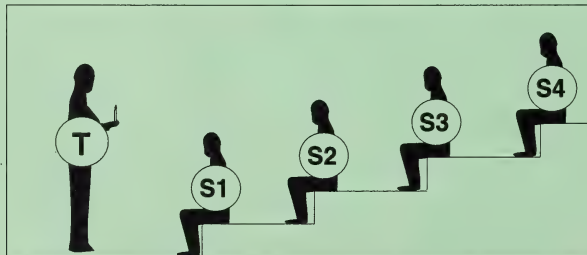


Andrew and Benita are attending a summer camp at a science centre. The next seven questions are about what they saw and learned.

Question 7

Use the following information to answer question 7.

This diagram shows a teacher holding a candle in the dark.



7. To which student would the light appear **least** intense?

- A. S1
- B. S2
- C. S3
- *D. S4

Curriculum Standard: The student is able to predict a decrease in light intensity as the distance between a light source and the observer increases.

Topic: Matter and Energy (Light)

Domain: Skills

Question 8

8. Benita studied a display of bean plants showing different growing behaviours. Which behavior is caused by a response to light?
- A. Roots move towards water
 - *B. Leaves grow toward the sun
 - C. Stems grow straight
 - D. Stems wrap around objects

Curriculum Standard: The student knows that plant leaves more towards light.

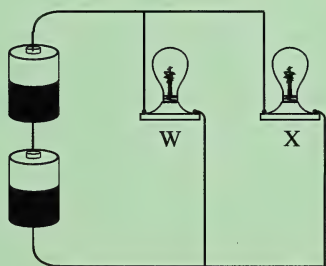
Topic: Living Things and Environment (Adaptations)

Domain: Concepts

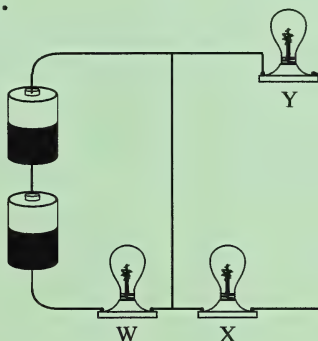
Question 9

9. Andrew made some drawings of circuits used for display boards. If bulb W burns out, in which circuit will at least one bulb continue to glow?

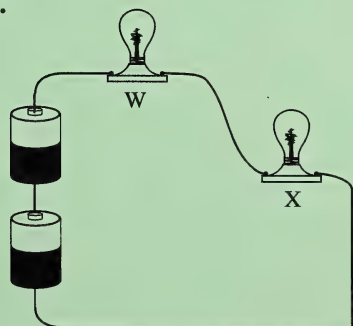
*A.



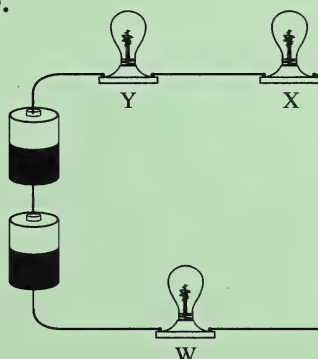
B.



C.



D.



Curriculum Standard: The student is able to predict the effect on a circuit when a bulb burns out.

Topic: Matter and Energy (Electricity)

Domain: Skills

Question 10

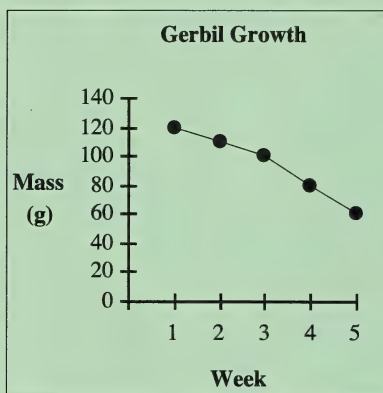
Use the following information to answer question 10.

An animal keeper at the science centre recorded the mass of a gerbil:

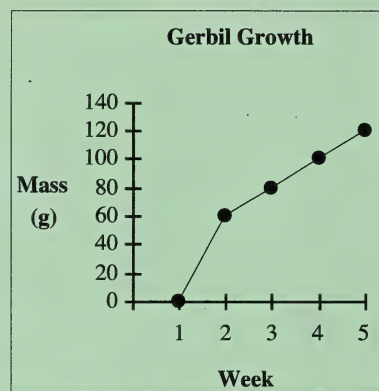
Week	Mass (g)
1	60
2	80
3	100
4	110
5	120

10. Which graph correctly shows the growth of the gerbil?

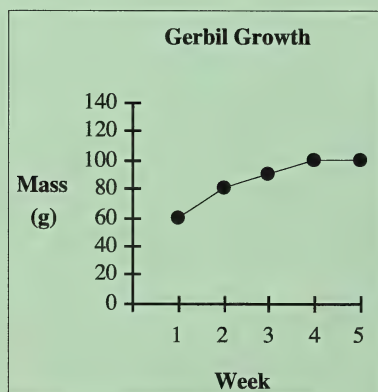
A.



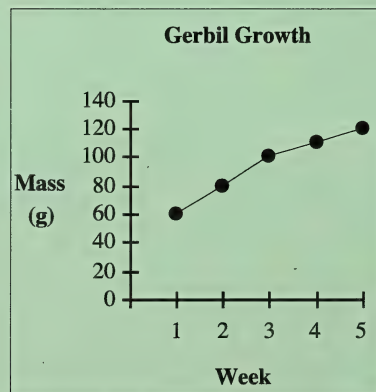
B.



C.



*D.



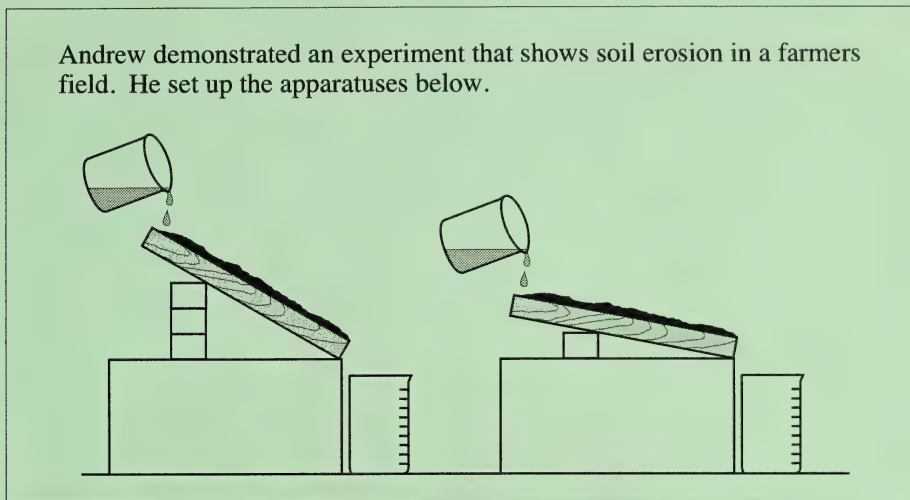
Curriculum Standard: The student is able to communicate data shown in a table in a graph.

Topic: Living Things and Environment

Domain: Skills

Question 11

Use the following information to answer question 11.



11. Andrew is **most likely** testing the hypothesis that the amount of erosion depends on the
- A. type of soil
 - B. amount of rain that falls
 - C. amount of plant cover on the soil
 - *D. slope of the land

Curriculum Standard: The student is able to make a hypothesis after studying the design of an experiment about soil erosion.

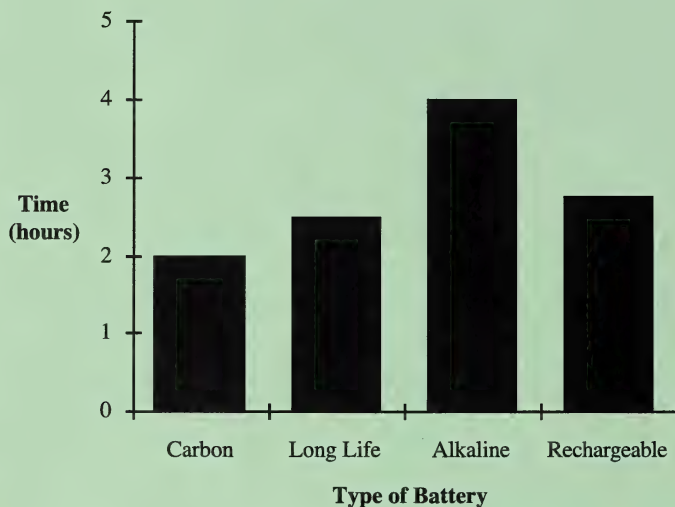
Topic: Earth, Space, and Time

Domain: Skills

Question 12

Use the following information to answer question 12.

Benita studied information about how long different batteries lasted when used in a video game.



12. According to the graph, the batteries that were labelled Long Life lasted

- A. 2.0 hours
- *B. 2.5 hours
- C. 4.5 hours
- D. 5.0 hours

Curriculum Standard: The student is able to interpret data, given in a graph, about the amount of time different batteries would last in a video game.

Topic: Matter and Energy (Electricity)

Domain: Skills

Question 13

Use the following information to answer question 13.

Andrew looked at a chart showing the boiling and freezing temperatures of different liquids.

Liquid	Boiling Point (becomes vapor)	Freezing Point (becomes solid)
Mercury	356°C	-38°C
Water	100°C	0°C
Alcohol	79°C	-112°C
Bromine	59°C	-7°C

13. If Andrew plans to measure temperatures below -40°C , which thermometer liquid would be **best** to use?
- A. Mercury
 - B. Water
 - *C. Alcohol
 - D. Bromine

Curriculum Standard: The student knows how thermometers measure temperatures.

Topic: Earth, Space, and Time (Weather)

Domain: Concepts

Credits

Donald Guttridge, *Brave Season* (London, Ontario, University of Western Ontario, 1986) p.11.

Alberta Education Contacts

Questions or comments regarding this bulletin should be directed to:

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